

wafer sample by directing a charged-particle beam to the sample and obtaining resulting signals, the method comprising the steps of establishing measurement regions containing holes on the sample and directing the charged particle beam to the measurement regions containing holes on the sample and directing the charged particle beam to the measurement regions on the sample containing holes. See Liu [588] abstract, figs. 5, 8, col. 8 lines 1-50, and col. 11 lines 1-30. However, Liu [588] does not specifically state detecting an electrical current flowing between each of the measurement regions on the sample and ground, finding data about a current distribution on the sample from detecting values of electrical current, and displaying a brightness-based map on a display unit according to the found data about the current distribution. Lee [579] does teach detecting an electrical current flowing between each of the measurement regions on the sample and ground, finding data about a current distribution on the sample from detecting values of electrical current, and displaying a brightness-based map on a display unit according to the found data about the current distribution. See Lee [579] abstract, col. 2 lines 15-50, col. 3 lines 35-50, col. 4 lines 10-30, col. 55-65, col. 5 lines 5-10, and 45-50. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to detect an electrical current flowing between each of the measurement regions on the sample and ground, finding data about a current distribution on the sample from detecting values of electrical current, and displaying a brightness-based map on a display unit according to the found data about the current distribution in order to obtain a good image contrast as taught by Lee [579].

Reconsideration is respectfully requested.

The Examiner acknowledges that the Liu et al. patent does not disclose detecting an electron current flowing to ground in each measurement region during SEM irradiation. The Liu et al. patent is directed to using secondary ion mass spectrometry (SIMS) for the purpose of analyzing the coating depthwise in the holes or vias. The Liu et al. method requires the destruction of the wafer specimen in the process of the depthwise analysis. The surface of the sample must be eroded away by bombardment in order to detect the composition deeper into the throughholes.

The Lee et al. patent discloses a method relating to secondary electron emission. The state of the holes is determined by comparing the contrast in emissions from the hole itself and the surface adjacent to the holes.

Neither the Lee et al. patent nor the Liu et al. patent suggests detecting current flowing through the substrate directly to ground. Hence, no combination of the teachings of these two references can result in the subject matter set forth in Applicant's claim 1 as amended.

Claim 2 is nonobvious for the reasons set forth for claim 1.

Claim 3 is nonobvious for the reasons set forth in claim 1 above, and further because the Liu et al. patent does not teach selecting regions having identical positions within periodic (repetitive) patterns formed on the specimen.

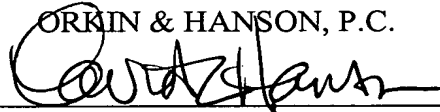
Claims 4, 5, 6, and 7 are nonobvious at least for the reasons set forth for claim 1 above. With the Applicant's method, it is merely necessary to measure currents, either average current or total current, over a period of time, which is much simpler and less likely to error than either SIMS processes or processes wherein adjacent surfaces are compared on secondary electron images.

In view of the foregoing amendments and remarks, it urged this case is now in condition for allowance.

Respectfully submitted,

WEBB ZIESENHEIM LOGSDON
ORKIN & HANSON, P.C.

By



David C. Hanson, Reg. No. 23,024
Attorney for Applicant
700 Koppers Building
436 Seventh Avenue
Pittsburgh, PA 15219-1818
Telephone: 412-471-8815
Facsimile: 412-471-4094
E-Mail: webblaw@webblaw.com



MARKED-UP VERSIONS OF CLAIMS 1 and 3

1. (Amended) A method of inspecting the state of completeness of the formation of a large number of holes formed in a wafer sample by directing a charged-particle beam to the sample and obtaining resulting signals, said method comprising the steps of:

establishing measurement regions containing holes on the sample;

directing said charged-particle beam to the measurement regions on the sample containing the holes;

detecting an electrical current flowing [between] through the wafer sample to ground for each of said measurement regions [on the sample and ground];

finding data about a current distribution on the sample from detected values of electrical current; and

displaying a brightness-based map on a display unit according to said found data [abut] about the current distribution.

3. (Amended) The method of claim 1, wherein the regions irradiated with said charged-particle beam are located in [certain] identical positions within periodic patterns formed on said sample.